CLAIMS

Sub A1

1. An electrical circuit assembly comprising two components bonded together with a joint structure, the joint structure comprising a mesh infiltrated by a solder material.

2. The electrical circuit assembly according to claim 1, wherein the mesh is formed of woven strands of copper or copper alloy wire.

3. The electrical circuit assembly according to claim 1, wherein a first of the components is a circuit element and a second of the components is a conductor on a substrate.

4. The electrical circuit assembly according to claim 3, wherein the conductor is a heatsink of the substrate.

5. The electrical circuit assembly according to claim 3, wherein the circuit element is an integrated circuit chip on a surface region of the substrate, and the joint structure contacts a surface of the integrated circuit chip.

6. The electrical circuit assembly according to claim 5, wherein a portion of the mesh extends outside of the joint structure to define a flexible jumper to the surface of the integrated circuit chip.

7. The electrical circuit assembly according to claim 5, further comprising an interconnect strap contacting the integrated circuit chip and a second surface region of the substrate, the interconnect strap comprising a mesh of which at least a portion is infiltrated by a solder material.

8. The electrical circuit assembly according to claim 7, wherein the solder material of the interconnect strap has a lower melting temperature than the solder material of the joint structure.

9. The electrical circuit assembly according to claim 7, wherein the interconnect strap is bonded to a third component on the second surface region of the substrate.

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10. The electrical circuit assembly according to claim 1, wherein a first of the components comprises multiple capacitors with terminals, a second of the components is a conductor on a substrate, and the joint structure bonds one terminal of each capacitor to the conductor.

11. The electrical circuit assembly according to claim 10, further comprising a second joint structure comprising a mesh infiltrated by a solder material, the mesh of the second joint structure being formed of a material having a higher thermal conductivity than the solder material of the second joint structure, the second joint structure bonding a second of the terminals to the substrate.

12. The electrical circuit assembly according to claim 11, wherein portions of the meshes of each of the joint structure and the second joint structure extend outside of the joint structure and the second joint structure to define two caps that overlie each of the terminals.

13. The electrical circuit assembly according to claim 12, wherein each of the caps comprises a second solder material that infiltrates the portion of the mesh and has a higher melting temperature than the solder materials of the joint structure and the second joint structure.

14. A semiconductor assembly comprising a heat-generating semiconductor device that is attached to a conductor on a substrate with a joint structure, the joint structure comprising a mesh infiltrated by a solder material that bonds together the semiconductor device, the conductor and the mesh, the mesh being formed of a material having a higher thermal conductivity than the solder material, the mesh substantially establishing the thickness of the joint structure.

15. The semiconductor assembly according to claim 14, wherein the mesh is formed of woven strands of copper or copper alloy wire.

16. The semiconductor assembly according to claim 14, wherein the conductor is a heatsink of the substrate.

17. The semiconductor assembly according to claim 14, wherein the semiconductor device is an integrated circuit chip, and the joint structure is between and contacts a surface of the integrated circuit chip and a surface of the conductor.

18. The semiconductor assembly according to claim 17, wherein a portion of the mesh extends outside of the joint structure to define a flexible jumper to the surface of the integrated circuit chip.

19. The semiconductor assembly according to claim 17, further comprising an interconnect strap contacting a second surface of the integrated circuit chip and a third component on the substrate, the interconnect strap comprising a mesh having first and second portions at the second surface of the integrated circuit chip and the third component, respectively, and an intermediate portion therebetween, the first and second portions of the mesh being infiltrated by a solder material while the intermediate portion is

substantially free of a solder material.

20. The semiconductor assembly according to claim 19, wherein the solder material of the interconnect strap has a lower melting temperature than the solder material of the joint structure.

21. A method of bonding together two components with a joint structure, the method comprising the step of forming the joint structure of a mesh infiltrated by a solder material.

22. The method according to claim 21, wherein the mesh is formed of woven strands of copper or copper alloy wire.

23. The method according to claim 21, wherein a first of the components is a circuit element and a second of the components is a conductor on a substrate, and the forming step comprises bonding the circuit element to the conductor.

24. The method according to claim 23, wherein the conductor is formed as a heatsink of the substrate.

25. The method according to claim 23, wherein the circuit element is an integrated circuit chip on a surface region of the substrate, and the joint structure contacts a surface of the integrated circuit chip.

26. The method according to claim 25, wherein the joint structure is formed so that a portion of the mesh extends outside of the joint structure to define a flexible jumper to the surface of the integrated circuit chip.

27. The method according to claim 25, further comprising the step of forming an interconnect strap that contacts a second surface of the integrated circuit chip and a second surface region of the substrate, the interconnect strap comprising a mesh of which at least a portion is infiltrated by a solder material.

28. The method according to claim 27, wherein the solder material of the interconnect strap has a lower melting temperature than the solder material of the joint structure.

29. The method according to claim 27, further comprising the step of bonding the interconnect strap to a third component on the second surface region of the substrate.

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30. The method according to claim 21,wherein a first of the components is a circuit element comprising multiple capacitors with terminals, a second of the components is a conductor on a substrate, and the joint structure is formed to bond one terminal of each capacitor to the substrate.

31. The method according to claim 30, further comprising the step of forming a second joint structure to bond a second of the terminals to the substrate, the second joint structure comprising a mesh infiltrated by a solder material, the mesh of the second joint structure being formed of a material having a higher thermal conductivity than the solder material of the second joint structure.

32. The method according to claim 31, wherein the joint structure and the second joint structure are formed so that portions of their respective meshes extend outside of the joint structure and the second joint structure to define two caps that overlie each of the terminals.

33. The method according to claim 32, wherein each of the caps comprises a second solder material that infiltrates the portion of the mesh and has a higher melting temperature than the solder materials of the joint structure and the second joint structure.

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34. A method of attaching a heat-generating semiconductor device to a conductor on a substrate with a joint structure, the method comprising the steps of:

providing on the conductor a preliminary structure comprising a mesh and a solder material the mesh being formed of a material having a higher thermal conductivity than the solder material;

placing the semiconductor device on the preliminary structure; and then

forming the joint structure by heating the preliminary structure so that the solder material melts, infiltrates the mesh, and bonds together the semiconductor device, the conductor and the mesh, the mesh substantially establishing the thickness of the joint structure.

35. The method according to claim 34, wherein the mesh is formed of woven strands of copper or copper alloy wire.

36. The method according to claim 34, wherein the conductor is formed as a heatsink of the substrate.

37. The method according to claim 34, wherein the semiconductor device is an integrated circuit chip, and the joint structure is formed between and contacts a surface of the integrated circuit chip and a surface of the conductor.

38. The method according to claim 37, wherein the joint structure is formed so that a portion of the mesh extends outside of the joint structure to define a flexible jumper to the surface of the integrated circuit chip.

39. The method according to claim 37, further comprising the

step of forming an interconnect strap that contacts a second surface of the integrated circuit chip and a third component on the substrate, the interconnect strap comprising a mesh having first and second portions at the second surface of the integrated circuit chip and the third component, respectively, and an intermediate portion therebetween, the first and second portions of the mesh being infiltrated by a solder material while the intermediate portion is substantially free of a solder material.

40. The method according to claim 39, wherein the solder material of the interconnect strap has a lower melting temperature than the solder material of the joint structure.